

Claims

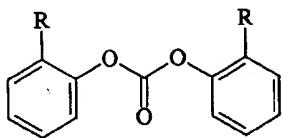
[c1] 1. A method for preparing an end-capped polycarbonate resin, comprising the step of processing a mixture comprising a polycarbonate having free hydroxyl-end groups and an end-capping reagent in a melt transesterification reaction to produce a polycarbonate resin, wherein the end-capping reagent comprises a mixture of:
(a) at least one species of a symmetrical activated aromatic carbonate, and
(b) at least one species of an optionally-substituted phenol, whereby said end-capping reagent reacts with at least some of the free hydroxyl end-groups of the polycarbonate to produce an end-capped polycarbonate resin.

[c2] 2. The method of claim 1, wherein the end-capping reagent contains the symmetrical activated aromatic carbonate and the optionally-substituted phenol in a mole ratio of from 10:90 to 90:10.

[c3] 3. The method of claim 2, wherein the end-capping reagent is added in an amount such that the mole ratio of total carbonate in the end-capping reagent to free-hydroxyl end groups is from 0.5 to 3.

[c4] 4. The method of claim 1, wherein the end-capping reagent is added in an amount such that the mole ratio of total carbonate in the end-capping reagent to free-hydroxyl end groups is from 0.5 to 3.

[c5] 5. The method of claim 1, wherein the end-capping reagent comprises as a symmetrical activated aromatic carbonate a compound of the formula:



wherein R is an electronegative substituent.

[c6] 6. The method of claim 5, wherein the electronegative substituent R is selected from among nitro groups, halo groups, and carbonyl-containing groups.

[c7] 7. The method of claim 6, wherein the electronegative substituents R are selected from among methoxycarbonyl, ethoxycarbonyl, propoxycarbonyl, phenylcarbonyl, phenoxy carbonyl, and benzyloxycarbonyl.

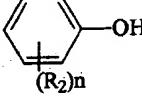
[c8] 8. The method of claim 7, wherein the electronegative substituent R is methoxycarbonyl.

[c9] 9. The method of claim 6, wherein the end-capping reagent contains the symmetrical activated aromatic carbonate and the optionally-substituted phenol in a mole ratio of from 10:90 to 90:10.

[c10] 10. The method of claim 9, wherein the end-capping reagent is added in an amount such that the mole ratio of total carbonate in the end-capping reagent to free-hydroxyl end groups is from 0.5 to 3.

[c11] 11. The method of claim 6, wherein the end-capping reagent is added in an amount such that the mole ratio of total carbonate in the end-capping reagent to free-hydroxyl end groups is from 0.5 to 3.

[c12] 12. The method of claim 5, wherein the optionally-substituted phenol is a compound of the general formula:



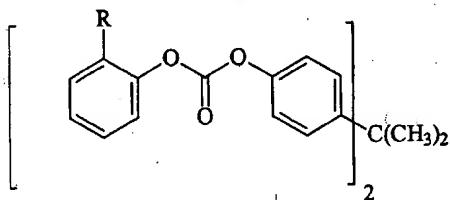
wherein the substituents R₂ may be the same or different and are selected from among H, C₁-C₃₆ alkyl, C₁-C₃₆ alkoxy, C₆-C₃₆ aryl, C₆-C₃₆ aryloxy, C₇-C₃₆ arylalkyl, or C₇-C₃₆ arylalkoxy and n is an integer between 1 and 5.

[c13] 13. The method of claim 12, wherein the end-capping reagent comprises as a optionally-substituted phenol a compound selected from among phenol, p-cumylphenol, 4-*tert*-butylphenol, octylphenol, nonylphenol, dodecylphenol, 3-pentadecylphenol, and octadecylphenol.

14. The method of claim 12, wherein the end-capping reagent

comprises as a optionally-substituted phenol a compound selected from among 4- *tert*-butylphenol, nonylphenol, dodecylphenol, 3-pentadecylphenol, and octadecylphenol.

[c15] 15. The method of claim 1, wherein the end-capping reagent comprises as a symmetrical activated aromatic carbonate a compound of the formula:



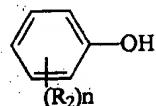
wherein R is an electronegative substituent.

[c16] 16. The method of claim 15, wherein the electronegative substituents R are selected from among nitro groups, halo groups, and carbonyl-containing groups.

[c17] 17. The method of claim 16, wherein the end-capping reagent contains the symmetrical activated aromatic carbonate and optionally-substituted phenol in a mole ratio of from 10:90 to 90:10.

[c18] 18. The method of claim 17, wherein the end-capping reagent is added in an amount such that the mole ratio of total carbonate in the end-capping reagent to free-hydroxyl end groups is from 0.5 to 3.

[c19] 19. The method of claim 15, wherein the optionally-substituted phenol is a compound of the general formula:

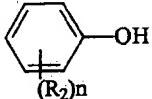


wherein the substituents R₂ may be the same or different and are selected from among H, C₁-C₃₆ alkyl, C₁-C₃₆ alkoxy, C₆-C₃₆ aryl, C₆-C₃₆ aryloxy, C₇-C₃₆ arylalkyl, or C₇-C₃₆ arylalkoxy and n is an integer between 1 and 5.

[c20] 20. The method of claim 19, wherein the end-capping reagent comprises as a optionally substituted phenol a compound selected from among phenol, p-cumylphenol, 4- *tert*-butylphenol, octylphenol, nonylphenol, dodecylphenol, 3-pentadecylphenol, and octadecylphenol.

[c21] 21. The method of claim 19, wherein the end-capping reagent comprises as a optionally substituted phenol a compound selected from among 4- *tert*-butylphenol, nonylphenol, dodecylphenol, 3-pentadecylphenol, and octadecylphenol.

[c22] 22. The method of claim 1, wherein the optionally-substituted phenol is a compound of the general formula:



wherein the substituents R_2 may be the same or different and are selected from among H, C_1-C_{36} alkyl, C_1-C_{36} alkoxy, C_6-C_{36} aryl, C_6-C_{36} aryloxy, C_7-C_{36} arylalkyl, or C_7-C_{36} arylalkoxy and n is an integer between 1 and 5.

[c23] 23. The method of claim 22, wherein the end-capping reagent comprises as a optionally substituted phenol a compound selected from among phenol, p-cumylphenol, 4- *tert*-butylphenol, octylphenol, nonylphenol, dodecylphenol, 3-pentadecylphenol, and octadecylphenol.

[c24] 24. The method of claim 22, wherein the end-capping reagent comprises as a optionally substituted phenol a compound selected from among 4- *tert*-butylphenol, nonylphenol, dodecylphenol, 3-pentadecylphenol, and octadecylphenol.

[c25] 25. The method according to claim 1, wherein the end-capping reagent is added to the polycarbonate in a reactor system of the continuous or semi-continuous type.

[c26] 26. The method according to claim 25, wherein the reactor system consists

of two or more reactors in series.

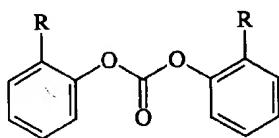
- [c27] 27. The method according to claim 25, wherein the end-capping reagent is added to the polycarbonate using a static mixer.
- [c28] 28. The method according to claim 1, wherein the formed polycarbonate has a content of phenols having electron-withdrawing ortho-substituents generated in the end-capping reaction of 500 ppm or below.
- [c29] 29. The method according to claim 1, wherein the formed polycarbonate has a content of phenols having electron-withdrawing ortho-substituents generated in the end-capping reaction of 100 ppm or below.
- [c30] 30. The method according to claim 1, wherein the formed polycarbonate has a content of end-capping reagent of 500 ppm or below.
- [c31] 31. The method according to claim 1, wherein the formed polycarbonate has a content of end-capping reagent of 100 ppm or below.
- [c32] 32. The method according to claim 1, wherein the formed polycarbonate has a content of terminal 2-(alkoxycarbonyl)phenyl, 2-(phenoxy carbonyl)phenyl, 2-(benzyloxycarbonyl)phenyl, and 2-benzoylphenyl groups of 5,000 ppm or below.
- [c33] 33. The method according to claim 1, wherein the formed polycarbonate has a content of terminal 2-(methoxycarbonyl)phenyl groups of 2,500 ppm or below.
- [c34] 34. The method according to claim 1, wherein the formed polycarbonate has a content of terminal 2-(methoxycarbonyl)phenyl groups of 1,000 ppm or below.
- [c35] 35. The method according to claim 1, wherein the formed polycarbonate has a content of terminal alkylphenyl groups of about 0.25 mole % or more.
- [c36] 36. The method according to claim 1, wherein the formed polycarbonate has a content of terminal alkylphenyl groups of about 0.5 mole % or more.

[c37] 37. The method according to claim 1, wherein the formed polycarbonate has a glass transition temperature of about 125 to 150 ° C.

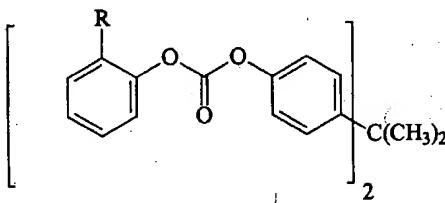
[c38] 38. The method according to claim 1, wherein the formed polycarbonate has a melt viscosity equal to or less than a phenyl-capped melt polycarbonate of similar number average molecular weight and polydispersity.

[c39] 39. An end-capping reagent consisting essentially of a mixture of:
(a) one or more species of symmetrical activated aromatic carbonate, and
(b) one or more species of an optionally substituted phenol, optionally in solvent, and optionally including a basic transesterification catalyst.

[c40] 40. The reagent of claim 39, wherein the end-capping reagent includes as a symmetrical activated aromatic carbonate a compound of the formula:



or



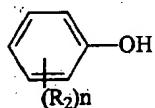
wherein R is an electronegative substituent.

[c41] 41. The reagent of claim 40, wherein the electronegative substituents R are selected from among nitro groups, halo groups, and carbonyl-containing groups.

[c42] 42. The reagent of claim 41, wherein the electronegative substituents R are selected from among methoxycarbonyl, ethoxycarbonyl, propoxycarbonyl, phenylcarbonyl, phenoxy carbonyl, and benzyloxycarbonyl.

[c43] 43. The reagent of claim 42, wherein the optionally-substituted phenol is a

compound of the general formula:



wherein the substituents R_2 may be the same or different and are selected from among H, $C_1 - C_{36}$ alkyl, $C_1 - C_{36}$ alkoxy, $C_6 - C_{36}$ aryl, $C_6 - C_{36}$ aryloxy, $C_7 - C_{36}$ arylalkyl, or $C_7 - C_{36}$ arylalkoxy and n is an integer between 1 and 5.

[c44] 44. The reagent of claim 43, wherein the end-capping reagent comprises as an optionally substituted phenol a compound selected from among phenol, p-cumylphenol, 4- *tert*-butylphenol, octylphenol, nonylphenol, dodecylphenol, 3-pentadecylphenol, and octadecylphenol.

[c45] 45. The reagent of claim 41, wherein the electronegative substituent R is methoxycarbonyl.

[c46] 46. The method of claim 45, wherein the end-capping reagent comprises as an optionally substituted phenol a compound selected from among 4- *tert*-butylphenol, nonylphenol, dodecylphenol, 3-pentadecylphenol, and octadecylphenol.

[c47] 47. The reagent of claim 41, wherein the end-capping reagent contains the activated aromatic carbonates and optionally substituted phenol in a mole ratio of from 10:90 to 90:10.